

US EPA ARCHIVE DOCUMENT



***EPA Research Forum:
Extreme Event Impacts on
Air and Water Quality
with a Changing Global Climate
Feb. 27, 2013***

***Development of
EPA's Stormwater Calculator
and SWMM
Climate Assessment Tools***

**Jason T. Berner, Landscape Architect
Office of Water/ Office of Science and Technology**

Friends of the Highline, 2013

Outline

Stormwater Management Design/Planning Tools:

- EPA Stormwater Calculator**

- EPA Climate Assessment Tool (CAT)**
 - Stormwater Calculator & SWMM (Stormwater Management Model) CAT Enhancements**
 - Climate Change Projection Scenario Data:
Temperature & Precipitation (*EPA CREAT 2.0 (Climate Resilience Evaluation & Awareness Tool)*)**

What are we doing and Why?

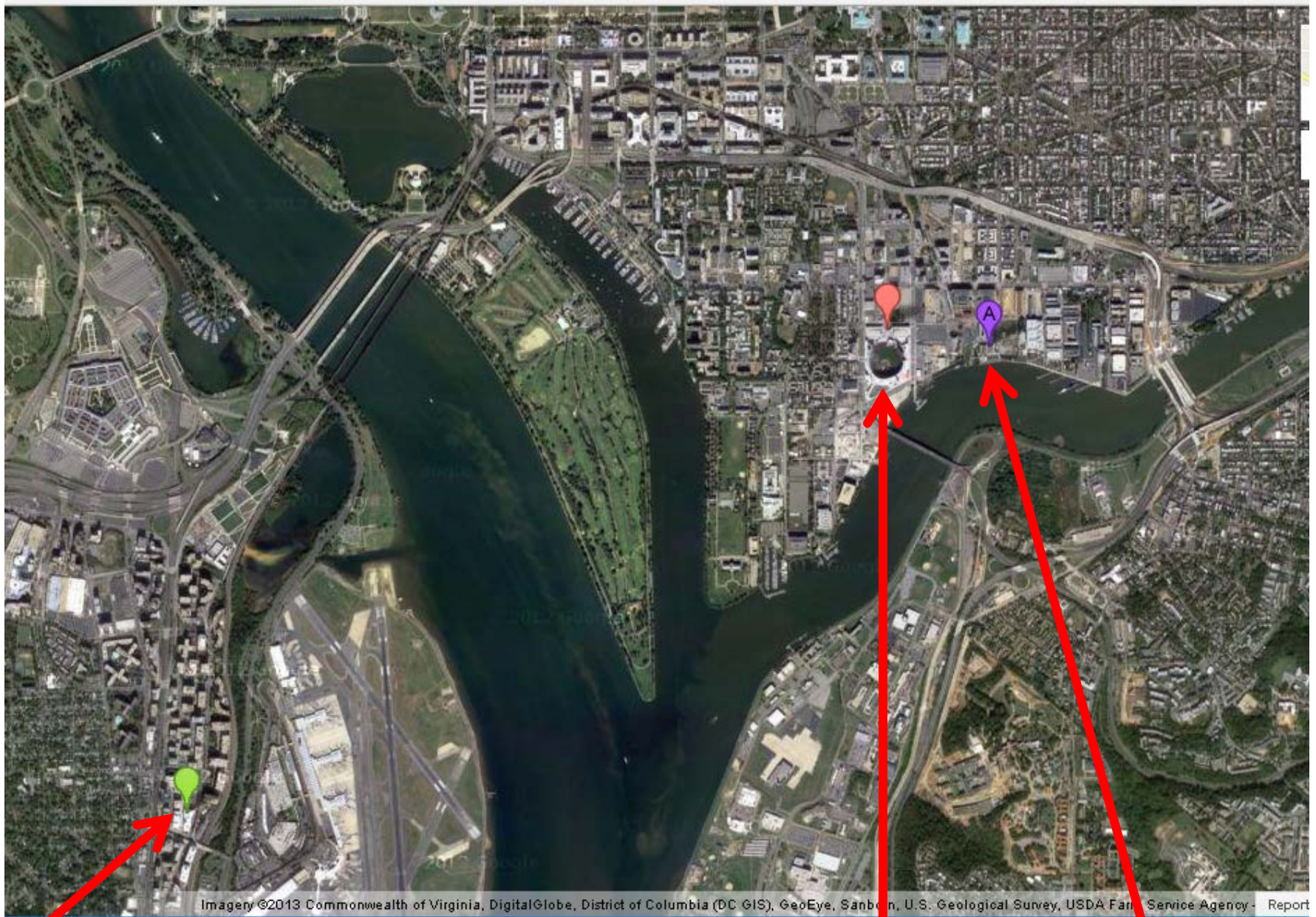
- **Stormwater Management (Green Infrastructure) Design and Planning Tool Needs:**
 - **Model pre and post construction stormwater runoff discharges**
 - **Screening level analysis of various green infrastructure practices throughout USA**
 - **Allow non-modelers to conduct screening level stormwater runoff analyses: urban & municipal planners, and land developers**
- ❖ **Enhancing SWMM and Stormwater Calculator with Climate Change Assessment Functionalities**
 - ❖ **Adaptation Strategies Guide: Sustainability and Green Infrastructure Information for Water and Wastewater Utilities**
(OWGDW, Climate Ready Water Utilities initiative)

EPA Stormwater Calculator

Washington, DC Redevelopment Project: Yards Park



The Yards Park, 2012



Imagery ©2013 Commonwealth of Virginia, DigitalGlobe, District of Columbia (DC GIS), GeoEye, Sanborn, U.S. Geological Survey, USDA Farm Service Agency - Report

Crystal City, VA

**Nationals
Baseball Stadium**

Yards Park

Yards Park, Pre-construction



JDland, 2013

Post Construction



The Yards Park, 2012

EPA Stormwater Calculator Site Analysis

National Stormwater Calculator

Overview

Location

Soil Group

Conductivity

Slope

Rainfall

Evaporation

Land Cover

LID Controls

Runoff Results

Site Name (Optional)

Search for an address or zip code:

Site Location (Latitude, Longitude)

Site Area (acres - Optional)

[Open a previously saved site](#)

Use the navigation tools on the map to locate the site to be analyzed and then click on its location. You can also locate the site by providing its address or zip code.

bing

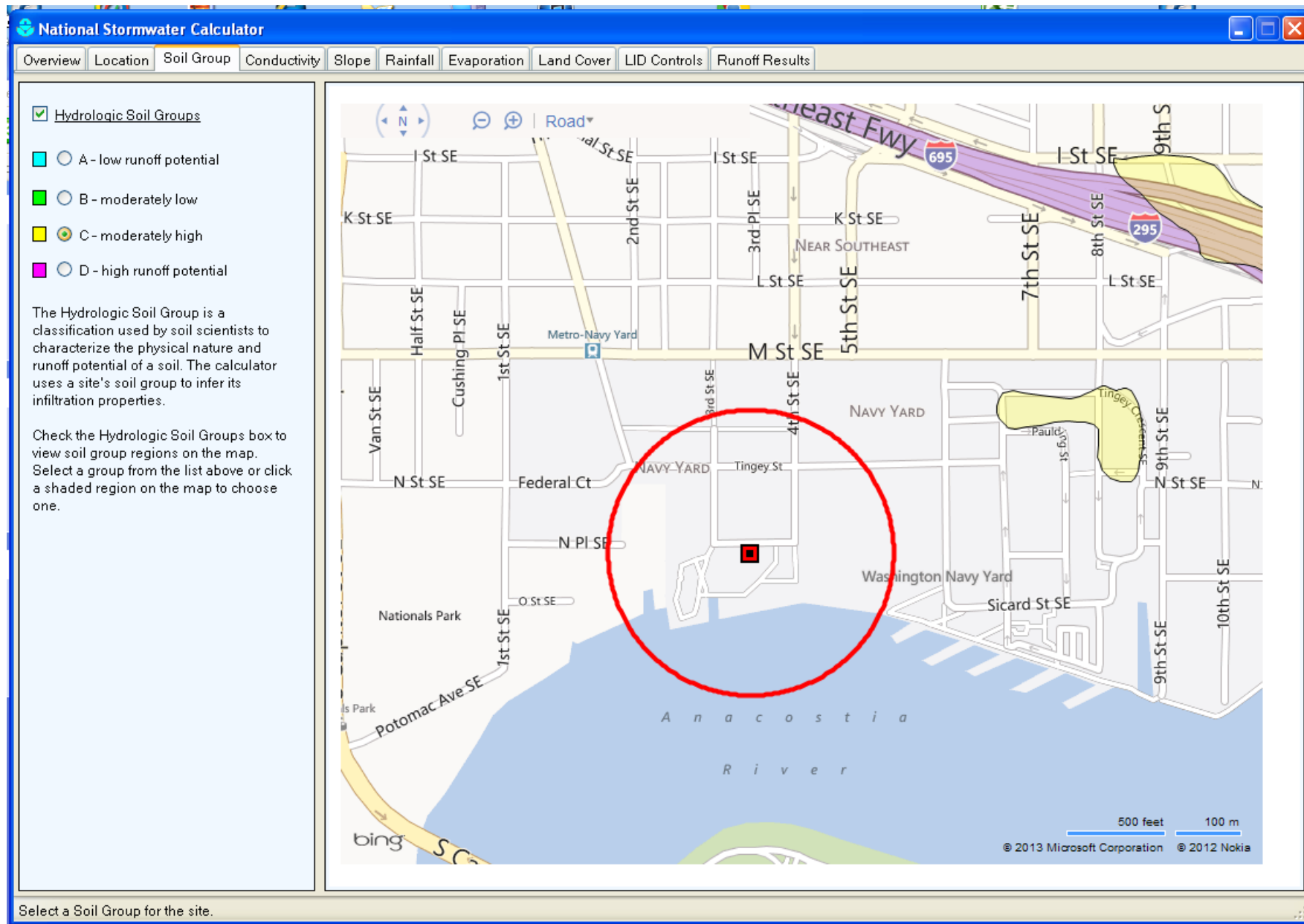
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250 feet

50 m

Locate the site on the map.

Hydrologic Soil Groups



Meteorological Data: Precipitation & Evaporation

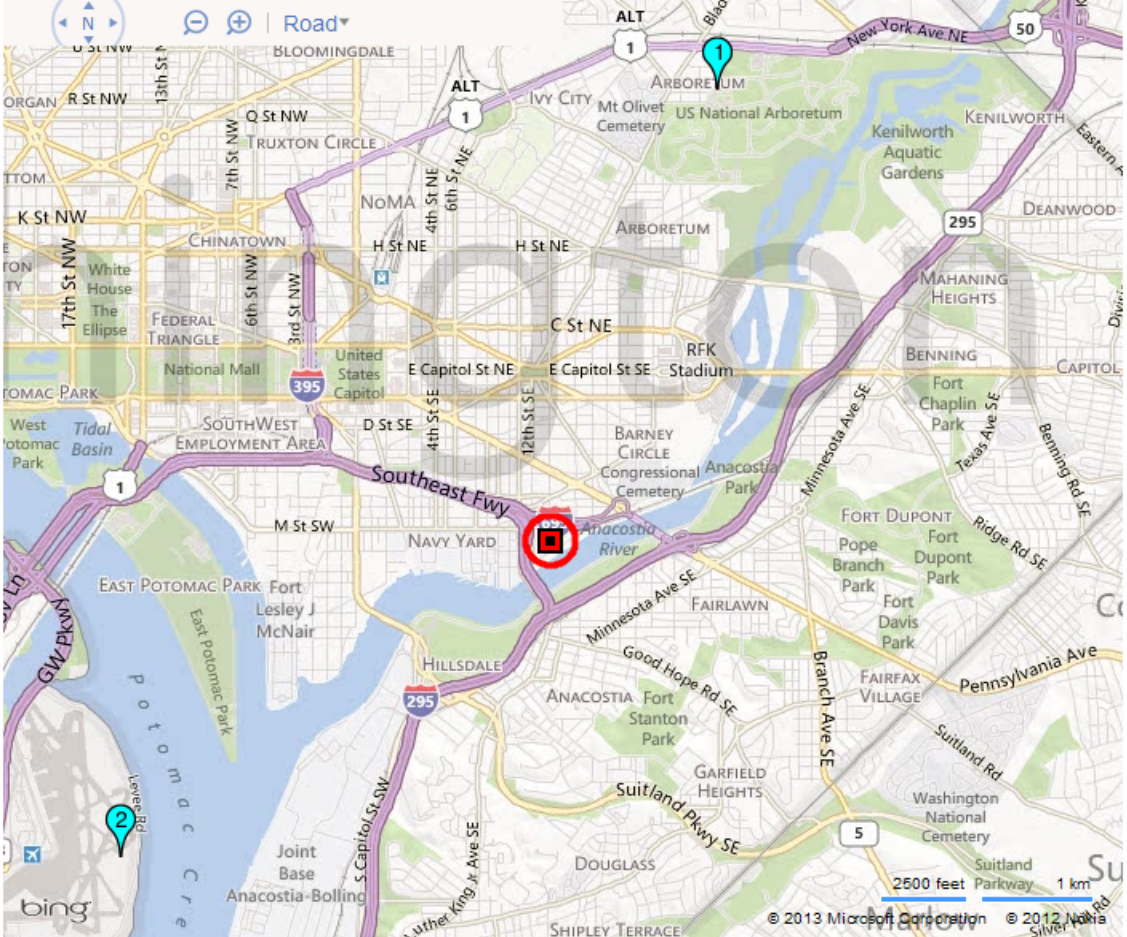
National Stormwater Calculator

Overview | Location | Soil Group | Conductivity | Slope | **Rainfall** | Evaporation | Land Cover | LID Controls | Runoff Results

Select a Source of Rainfall Data:

- 1 - NATIONAL ARBORETUM DC (1970-2006) 44.1"
- 2 - WASHINGTON REAGAN NATIONAL AIR (1970-2006) 45.85"
- 3 - DALECARLIA RESERVOIR (1970-2006) 45.85"
- 4 - BELTSVILLE (1970-2006) 43.30"
- 5 - UPPER MARLBORO 3 NNW (1970-2006) 44.0"

Rainfall data consist of hourly amounts recorded at the National Climatic Data Center monitoring stations listed above. The period of record and average annual rainfall are listed next to each station's name.



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Select a source of long-term hourly rainfall data.

Existing Land Cover

National Stormwater Calculator

Overview

Location

Soil Group

Conductivity

Slope

Rainfall

Evaporation

Land Cover

LID Controls

Runoff Results

Land Cover Distribution:

% Forest

5

% Meadow

5

% Lawn

35

% Desert

0

% Impervious

55

Land cover affects the amount of rainfall captured on vegetation or in natural depressions and determines surface roughness.

Enter the percentage of the site's area covered by each type of pervious surface. The remaining area is considered to be impervious (roofs, sidewalks, streets, parking lots, etc.).

Bird's eye

bing

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Assign a land cover distribution that reflects the site's state of development.

Existing Low Impact Development (LID) Controls

National Stormwater Calculator

[Overview](#) | [Location](#) | [Soil Group](#) | [Conductivity](#) | [Slope](#) | [Rainfall](#) | [Evaporation](#) | [Land Cover](#) | **LID Controls** | [Runoff Results](#)

% of Impervious Area Treated By:

Disconnection	0
Rain Harvesting	0
Rain Gardens	5
Green Roofs	0
Street Planters	5
Infiltration Basins	5
Porous Pavement	0

LID controls are landscaping practices designed to retain stormwater on site.

Enter the percentage of the site's impervious area treated by the LID practices listed. Click an LID practice to learn more about it and to edit its design parameters.

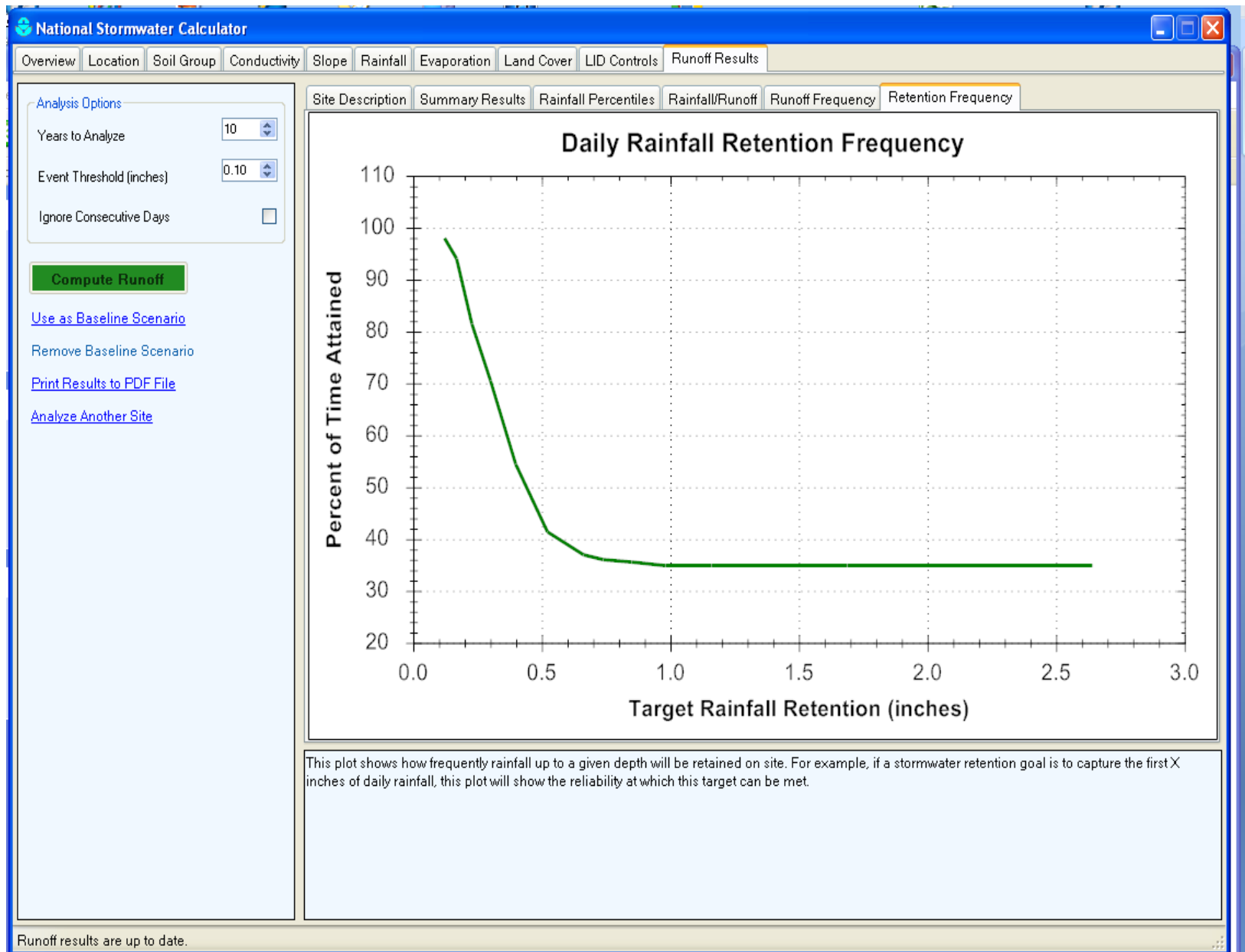
Design Storm Depth (in)
(for Auto-Sizing) 0.00

15% Impervious Area Treated

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Assign LID practices to capture runoff from impervious areas.

Baseline Stormwater Runoff Results



Redevelopment/Retrofit Scenario

National Stormwater Calculator

Overview | Location | Soil Group | Conductivity | Slope | Rainfall | Evaporation | Land Cover | **LID Controls** | Runoff Results

% of Impervious Area Treated By:

Disconnection	10
Rain Harvesting	20
Rain Gardens	5
Green Roofs	0
Street Planters	5
Infiltration Basins	5
Porous Pavement	30

LID controls are landscaping practices designed to retain stormwater on site.

Enter the percentage of the site's impervious area treated by the LID practices listed. Click an LID practice to learn more about it and to edit its design parameters.

Design Storm Depth (in) (for Auto-Sizing) 0.00

75% (60% change) Impervious Area Treated

Assign LID practices to capture runoff from impervious areas.

LID Control Design Specifications

National Stormwater Calculator

Overview Location Soil Group Conductivity Slope Rainfall Evaporation Land Cover **LID Controls** Runoff Results

% of Impervious Area: 100

[Disconnect Downspouts](#)

[Rain Harvesting](#)

[Rain Gardens](#)

[Green Roofs](#)

[Street Plantings](#)

[Infiltration Basins](#)

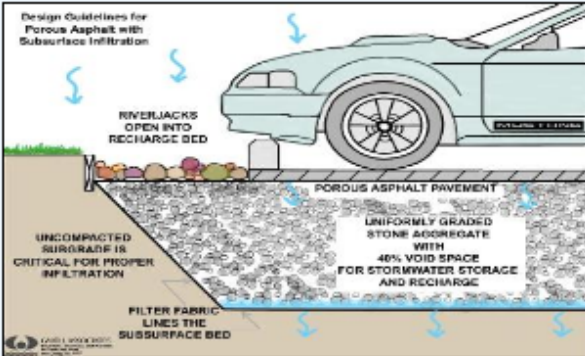
[Porous Pavement](#)

LID controls designed to reduce runoff from impervious areas. Enter the percentage of impervious area for each practice listed to learn more about their design parameters.

Design Storm (for Auto-Size): 2.0

LID Design

Porous Pavement



Design Guidelines for Porous Asphalt with Subsurface Infiltration

RIVER/JACKS OPEN INTO RECHARGE BED

POROUS ASPHALT PAVEMENT

UNCOMPACTED SUBGRADE IS CRITICAL FOR PROPER INFILTRATION


UNIFORMLY GRADED STONE AGGREGATE WITH 40% VOID SPACE FOR STORMWATER STORAGE AND RECHARGE

FILTER FABRIC LINES THE SUBSURFACE BED

Continuous Porous Pavement systems are excavated areas filled with gravel and paved over with a porous concrete or asphalt mix. Normally all rainfall will immediately pass through the pavement into the gravel storage layer below it where it can infiltrate at natural rates into the site's native soil.

Gravel layers are typically 6 to 18 inches high.

The Capture Ratio is the percent of the treated area that is replaced with porous pavement.



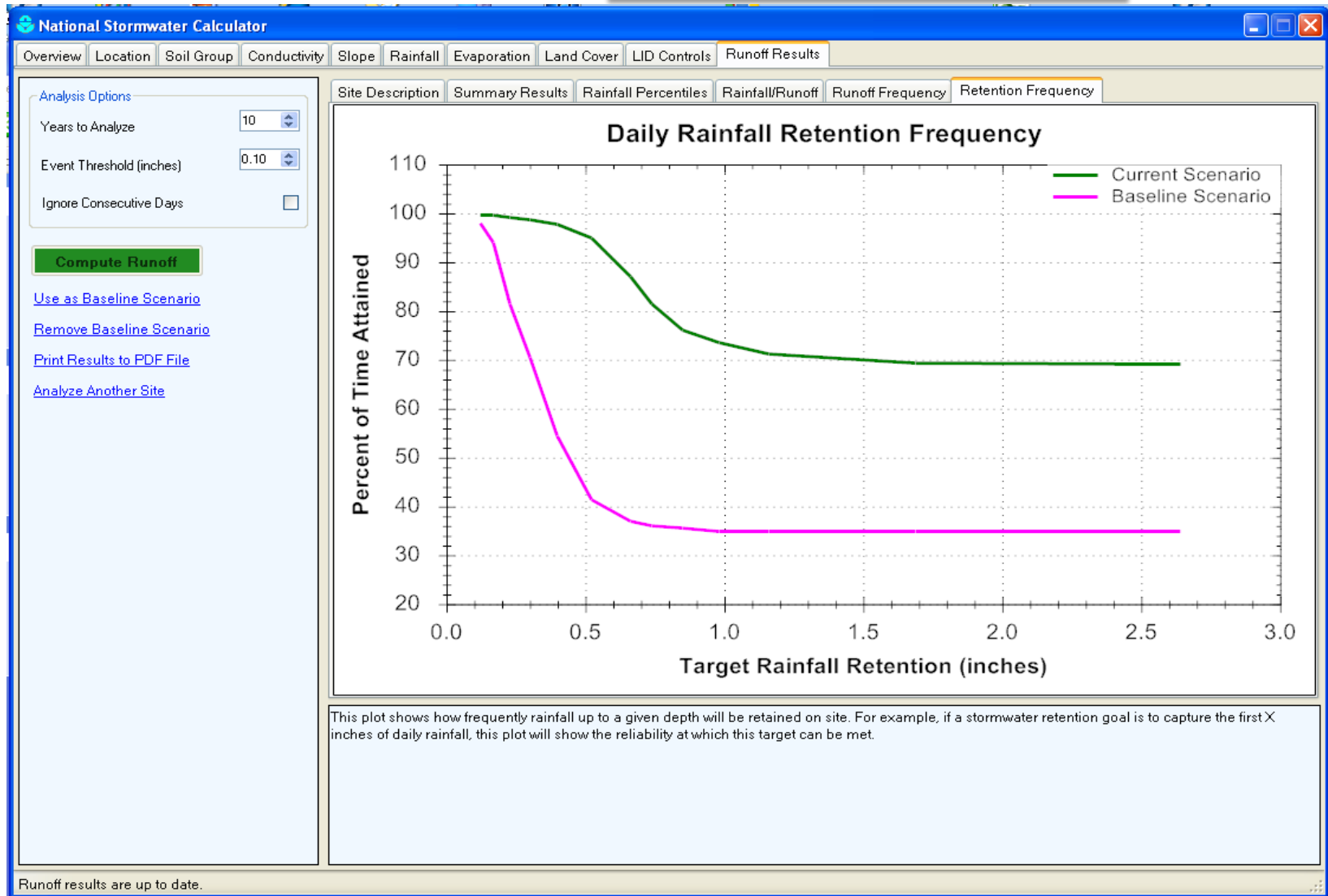
[Learn more ...](#)

Gravel Layer Thickness (inches): 18

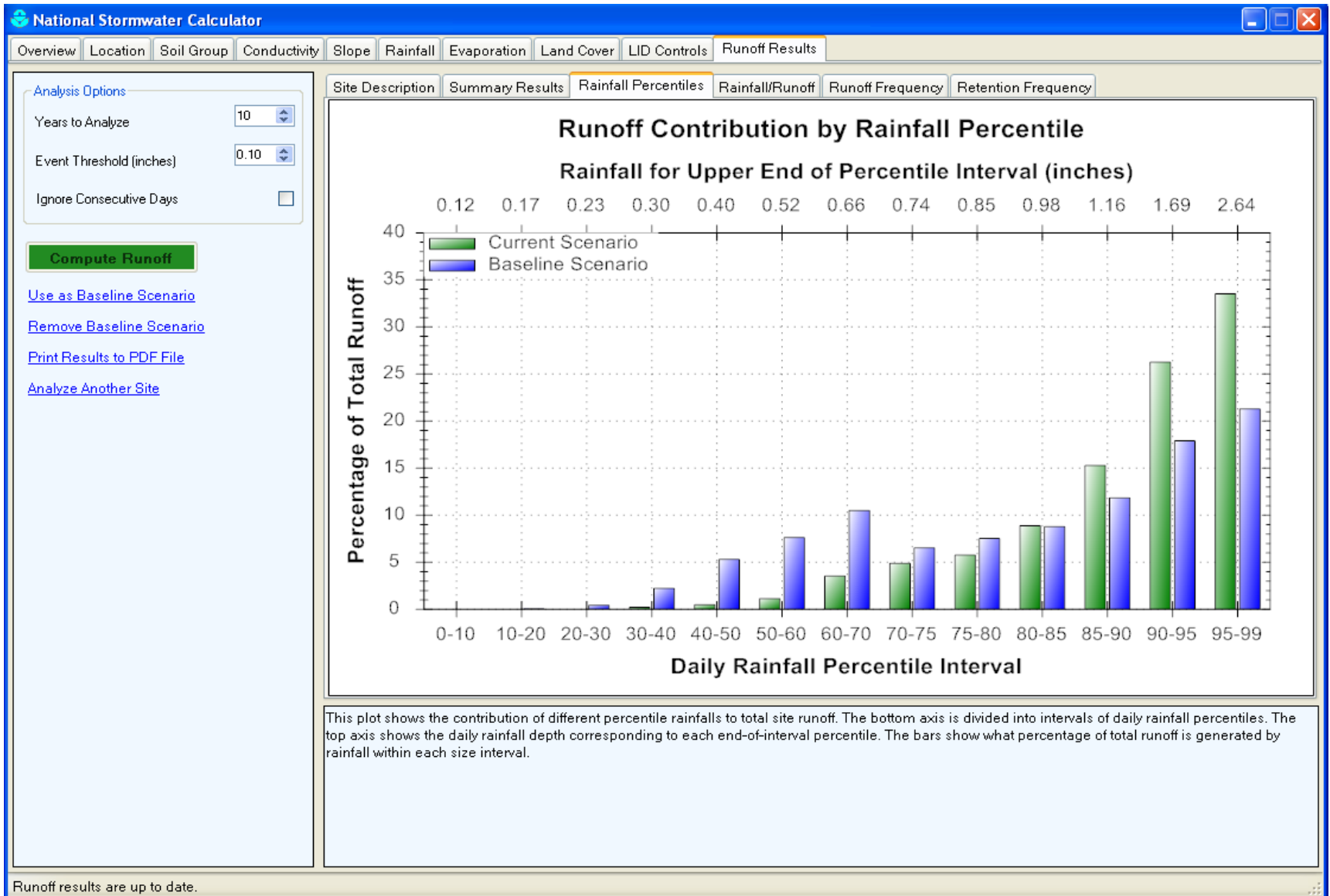
% Capture Ratio: 100

Auto-Size Restore Defaults Accept Cancel

Baseline and Retrofit/Redevelopment Scenarios: Runoff Results



Baseline and Retrofit/Redevelopment Scenarios: Runoff Results



Development of Climate Assessment Tools (CATs) and Climate Change Scenario Data for SWMM and the Stormwater Calculator

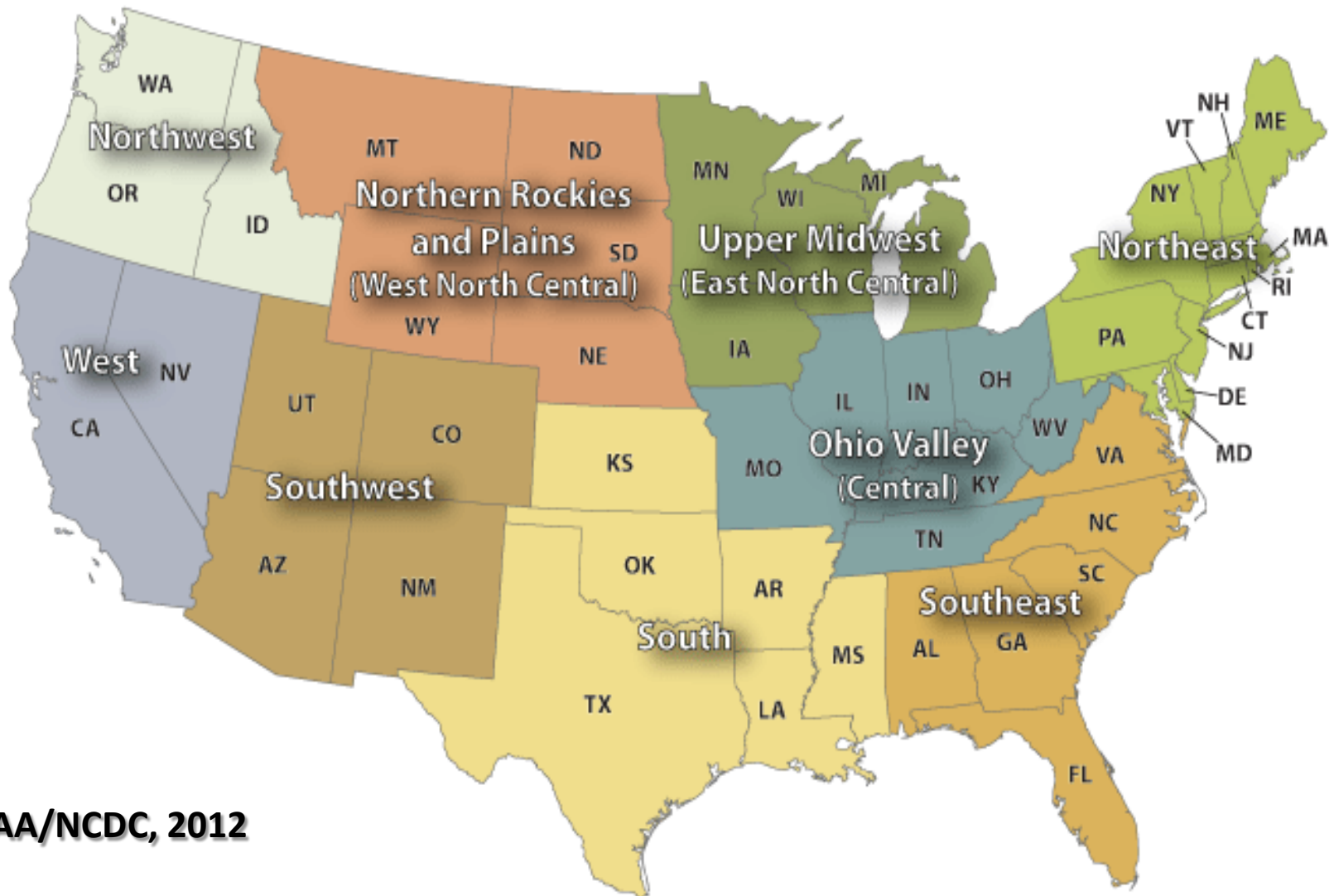
- **EPA BASINS CAT: ability to adjust existing NOAA National Climate Data Center meteorological data (precipitation and temperature)**
- **Ability to input user provided climate projection data**

Regional Climate Projection Data:

CREAT 2.0 (Climate Resilience Evaluation & Awareness Tool)

*****Precipitation & Temperature*****

U.S. Climate Regions



NOAA/NCDC, 2012

Regional Climate Projection Data

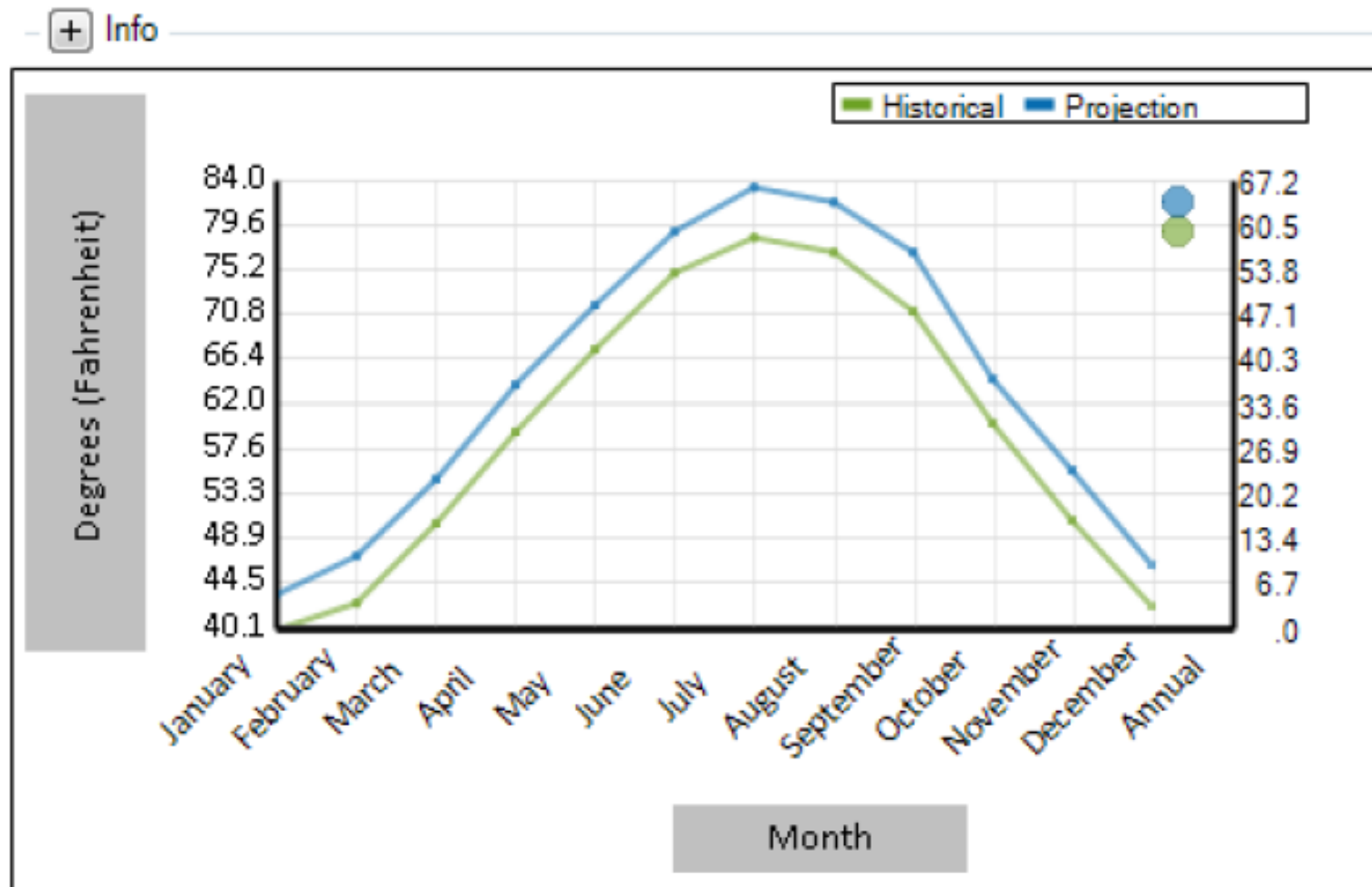
- **Based on IPPC (Intergovernmental Panel on Climate Change) models and U.S. Global Change Research Program literature values**
- **Hot and Dry, Middle, and Wet climate projection values for precipitation and temperature**
 - **Compare with historical NCDC/NOAA meteorological data**
 - **May assist with the design or retrofit of LID/green infrastructure stormwater management technologies for CSO or MS4 communities**

CREAT 2.0 Regional Climate Projection

Temperature Example Data

(Hot and Dry, Chapel Hill, NC):

Average Temperature



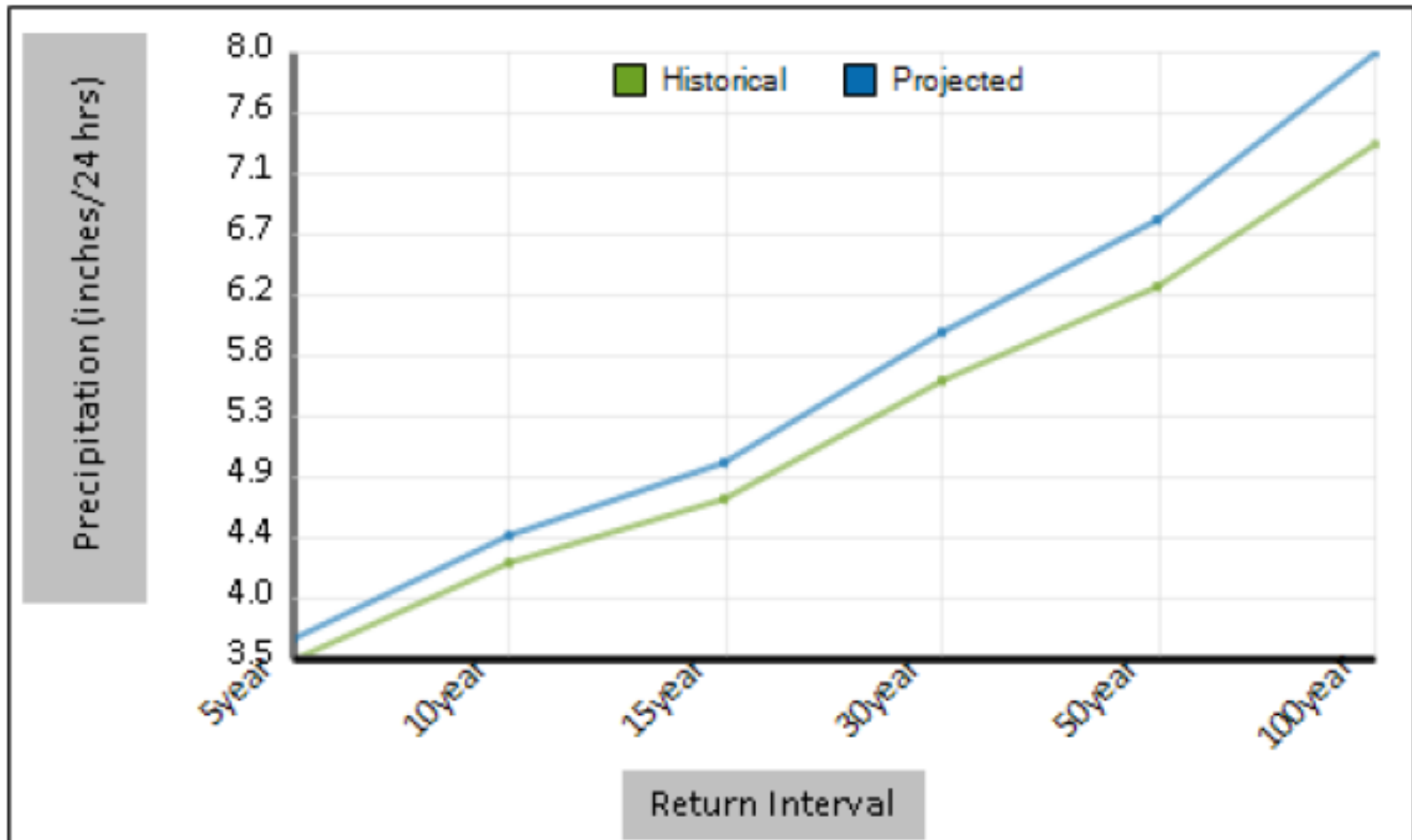
CREAT 2.0 Regional Climate Projection

Precipitation Example Data

(Hot and Dry, Chapel Hill, NC) :

24-h Event Precipitation

+ Info



Questions and Contact Info

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